



Utah Department of Transportation

Pothole Facts

In 2007 (last year of complete data) UDOT spent \$880,547 fixing potholes in asphalt roads and \$28,880 fixing potholes in concrete roads.

Breaking this down by regions we see:

Pothole Repair	
Region/District	FY2007 Spending
Region 1	\$154,895
Region 2	\$293,032
Region 3	\$226,848
Richfield District	\$ 47,718
Price District	\$ 95,487
Cedar City District	\$ 62,576
Statewide Totals	\$880,547

What Causes Potholes?



Figure 1. Typical pothole showing saturated area around unsealed cracks

Pavement deteriorates from the bottom up. This means that the thin new crack seen on the surface is actually the end of a wider crack deep in the road's foundation.

Potholes often result from unrepaired cracks. As water seeps through the pavement it saturates the soil below. Low temperatures cause the saturated soil to freeze and as it freezes the pavement heaves. Vehicle wheels further crack the pavement at the weakened spot. As freeze-thaw cycles continue and traffic runs over the pothole, it continues to grow.



Figure 2. Pothole Formation (from CalTrans “Pavement Preservation Treatment Construction Guide, Chapter 4: Patching and Edge Repair”)

The illustration above shows a typical pavement cross-section with three layers: soil, subbase, and pavement. Water from snow and rainfall seeps through the pavement. As temperature falls and the soil freezes, it heaves, creating a crack in the subbase. As the temperature rises the frozen soil thaws and retreats. Another freeze heave extends the crack up through the pavement overlay. As this cycle repeats, the soil retreats, creating a cavity under the subbase. As a car passes over the crack; the wheel load crushes the heaved portion down into the void, enlarging the crack into a pothole.

Potholes are a form of pavement disintegration that may be associated with poorly compacted material, raveling, cracking, base failure, or aging of the pavement. Potholes often appear after rain or during thaws when pavements are weaker. Generally accepted mechanisms for pothole formation are as follows:

- Raveling, stripping, or cracking in the pavement surface.
- Water penetrates the surface layers of the pavement, softening the underlying pavement layers, which increases deflections. Ice formation and heaving in the pavement occurs in some climatic areas.
- Fine material from the underlying pavement layers are lost, reducing overall structural strength and support for the pavement surface.
- Once a hole is formed, it will continue to grow until it is repaired. Figure 2 illustrates the role traffic plays in enlarging a pothole.

- after CalTrans “Pavement Preservation Treatment Construction Guide, Chapter 4: Patching and Edge Repair”

UDOT Pothole Repairs

We use a number of different products and methods to repair roads, based on how deteriorated the road is and when we intend to reconstruct the road. Potholes often occur in the winter and early spring when hot asphalt plants are not working. Hot asphalt is the very best pothole patch material. We consider a pothole patch to be a temporary repair which should last until the road is reconstructed or resurfaced.

If a pothole occurs on the freeway or other high volume road, shutting down a lane may disrupt traffic for hours, so we have to be very careful to not cause travelers excessive delays. For this reason our freeway repairs are often done late at night or before the morning rush hour.

What product do you use to repair roads?

Our standard pothole patch material for asphalt roads is a mixture of about 94% gravel and about 6% liquid asphalt. We buy this material, called "winter patch", by the truckload and store it at our maintenance stations until we need to use it. All the gravel passes through a 3/8" sieve. It is applied cold to road. Asphalt roads are usually resurfaced every six to ten years. Some roads are rebuilt at about twenty years, but most Utah roads receive periodic minor rehabilitation to renew the wearing surface and improve the ride. Major rehabilitation projects are sometimes deferred as funding may not be available.

If we can buy hot asphalt, we will use it first, since it is a much better patching material.

For fast repairs on roads with very heavy traffic (over 20,000 vehicles per day) we use a special product that sets up very fast and does not require extra mechanical compaction. It comes in a sealed bucket and one five gallon bucket usually fills a typical pothole.

For concrete roads we use the containerized patch because it lasts much longer. Containerized pothole patch has a five year shelf-life. Our concrete roads usually are repaired about every 10 years and are planned to be rebuilt every 40 years.

How often do you have to use this product before you have to repair again?

If the pothole is repaired properly, it should last until the road is rebuilt or resurfaced, which may be as long as three years. Sometimes the road base under the pothole is very soft or wet and it flexes when vehicles pass over it. This flexing may break the patch requiring repair again. 95% of our potholes are fixed with just one application. About 5% may fail within six months due to saturated road base. Fixing the road base is very expensive.

How expensive is it?

Cold mix "Winter Patch" material costs \$75 per ton.

Hot mix asphalt costs about \$98 per ton.

The containerized patch material costs \$40 per five-gallon bucket.

Do you use only one type of product or many different types?

We use different products in winter or summer and depending on how much traffic the road gets. If we can get hot asphalt we prefer to use it. Otherwise we use the cold mix described above. In heavy traffic areas we may use the fast-setting containerized product.

How long does it take to repair a pot hole?

Using hot mix or cold mix pothole patch material it takes about an hour to repair a pothole properly. This seems like a long time, but we have to divert traffic around the area we are working on, clean and dry the hole, apply a liquid asphalt to the edges of the holes, then place

the patch, compact it, clean up, and then retrieve our traffic control signs.

Using the containerized material it takes about 15 minutes. It takes so much less time because the hole does not have to be dried out and it does not require compaction

Are the products you use different during summer and winter? Why?

Yes. In summer we use hot mix asphalt if we can get it. We don't have many summer potholes. In winter we use cold mix asphalt that takes more time to set up. We use the cold mix because we usually cannot buy hot mix asphalt in the winter.

Why do they call it a Pothole?

Two centuries ago in central England pottery making was a major industry. Finding and mining good quality clay was a constant activity. Just as today, some property owners did not want their land torn up by the clay miners. Small pottery makers found it difficult to obtain sufficient clay to make their pottery since larger companies had the money to buy the best clay mines. Some enterprising persons found a way to supply clay to the small pottery makers and began digging clay at night from roads that were located next to clay deposits. Overnight, a road would be filled with holes left by these diggers. When it became known what was causing these holes the local people began calling them "potter's holes" or "potholes". Today we don't have clay diggers damaging roads, but holes still seemly appear overnight, so the term "pothole" applies.

An example of this pottery is shown below:



Figure 3. *Lord Nelson pattern serving plate from Staffordshire, England*